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# *Information Bulletin*

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## *Grade 9 Mathematics 1994-95*



This document was written primarily for:

Students	✓
Teachers	✓
Administrators	✓
Parents	
General Audience	
Others	✓ Superintendents

This bulletin contains general information about the Achievement Testing Program and information specific to the Grade 9 Mathematics Assessment. Additional copies of the bulletin may be made as needed.

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**October 1994**

# Contents

<b>General Information .....</b>	<b>1</b>
Administering the Assessment .....	1
Schedule .....	1
Students in French Language Programs .....	1
Marking Achievement Tests Locally .....	2
Reporting the Results .....	2
Broadened Assessment Initiatives .....	2
 <b>Description of the Mathematics Assessment Standards .....</b>	 <b>2</b>
Purpose of Assessment Standards .....	2
Acceptable Standard .....	3
Standard of Excellence .....	3
 <b>Grade 9 Mathematics Assessment .....</b>	 <b>4</b>
General Description .....	4
Reporting Categories Indicators .....	4
Blueprint .....	5
Confirming Standards .....	5
 <b>Preparing Students for the Assessment .....</b>	 <b>6</b>
Suggestions for Answering Multiple-Choice Questions .....	6
Suggestions for Answering Numerical-Response Questions .....	6
 <b>Suggestions for Teachers Administering the Assessment Example .....</b>	 <b>6</b>
Sample Questions .....	6
Part A: Multiple Choice .....	7
Part B: Numerical Response .....	12
Sample Questions: Key and Descriptors .....	16
 <b>Credit .....</b>	 <b>17</b>
 <b>Alberta Education Contact .....</b>	 <b>17</b>



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# General Information

The Achievement Testing Program provides teachers, parents, students, school administrators, Alberta Education, and the public with information about what students know and can do in relation to provincial standards. Group results are reported at school, district, and provincial levels to improve learning opportunities for students.

The assessments are administered in two subject areas at Grade 3—language arts and mathematics—and in four subject areas at grades 6 and 9—language arts, mathematics, social studies, and science.

The assessments are based on provincial standards, which reflect important learnings in the subject areas listed above. Classroom teachers from across the province are extensively involved in developing and field testing the assessment instruments.

## Administering the Assessment

Information about the nature of the provincial assessments as well as their administration to special-needs students can be found in the *General Information Bulletin, Achievement Testing Program*, which has been mailed to all superintendents and principals.

## Schedule

The written-response component of English and French Language Arts must be administered during the first week of June. The machine-scorable component of all achievement tests must be administered during the last two weeks of June. Specific information regarding scheduling is provided in the current *General Information Bulletin*.

To minimize any risks to security, we recommend that all students complete the test on the same day. Students who are absent when the tests are administered and who return to school by the end of the school year must write the tests upon their return. By scheduling the tests early in the administration period, schools can ensure that most, if not all, absentees are tested. The principal is responsible for ensuring the security of the tests.

Beginning in 1995, the tests that will be administered each year are:

### Grade 3

English Language Arts (*Part A: Writing and Part B: Reading*)

Mathematics (English and French forms)

### Grade 6

English Language Arts (*Part A: Writing and Part B: Reading*)

Mathematics (English and French forms)

Social Studies (English and French forms)

Science (English and French forms)

Français 6<sup>e</sup> Année (*Partie A: Production écrite and Partie B: Lecture*)

### Grade 9

English Language Arts (*Part A: Writing and Part B: Reading*)

Mathematics (English and French forms)

Social Studies (English and French forms)

Science (English and French forms)

Français 9<sup>e</sup> Année (*Partie A: Production écrite and Partie B: Lecture*)

## Students in French Language Programs

Beginning in June 1995, all students in Francophone and French Immersion programs must write the French form of the achievement tests. Alberta Education will send enrollment forms to schools by February requesting an indication of how many English or French tests are required. These forms must be returned through jurisdiction offices by mid-March.



## ***Marking Achievement Tests Locally***

Beginning in June 1995, teachers will be able to mark the tests before returning them to Alberta Education. Teachers can use the results as part of an individual student's year-end assessment, as well as for planning instruction. Additional information regarding local marking of tests will be provided in December 1994.

## ***Reporting the Results***

Each school jurisdiction will receive a district report and school reports for their students' achievement, as well as guidelines for interpreting these results in relation to provincial standards.

To facilitate reflection on school programs, we expect that results will be shared with all school staffs (not just teachers of grades 3, 6, and 9), as well as with parents and the community.

Individual student profiles will be sent to the school that the student will attend in September. We also expect that these reports will be shared with parents.

Provincial results will be made public in September. A detailed *Achievement Testing Program Provincial Report* is published annually.

## ***Broadened Assessment Initiatives***

The Student Evaluation Branch has developed additional instruments to collect a broader base of information about what students know and can do than achievement tests themselves can provide. These instruments will be administered to a provincial sample of students in all subjects on a rotating basis:

### **Grade 3**

- 1995 • "whole book" performance-based assessment in language arts
- 1996 • problem-solving activities in mathematics
- 1997 • "whole book" performance-based assessment in language arts
- 1998 • problem-solving activities in mathematics

### **Grade 6**

- 1995 • problem-solving activities in mathematics
- 1996 • "whole book" performance-based assessment in language arts
- 1997 • problem-solving and decision-making activities in social studies
- 1998 • performance tasks in science

### **Grade 9**

- 1995 • problem-solving and decision-making activities in social studies
- 1996 • problem-solving activities in mathematics
- 1997 • performance tasks in science
- 1998 • performance tasks in language arts

## ***Description of the Mathematics Assessment Standards***

The provincial standards are the basis upon which we assess how well students have learned mathematics by the end of Grade 9. These standards reflect essential learnings that all Alberta students are expected to achieve. Provincial standards are useful, therefore, for assessing Grade 9 students in all types of school programs—public, private, and home education.

### ***Purpose of Assessment Standards***

These statements describe what is expected of Grade 9 students who are meeting the *acceptable standard* or the *standard of excellence* on independent work at the end



of the Grade 9 Mathematics program. The statements represent the standards against which student achievement will be measured. By comparing actual results to expected provincial standards, decisions can be made about whether achievement is in fact “good enough.”

### *Acceptable Standard*

Students who meet the acceptable standard in Grade 9 Mathematics are expected to have a basic understanding of concepts and procedural knowledge and problem-solving applications. They are expected to demonstrate understanding in concrete, pictorial, and symbolic modes, and be able to translate from one mode to another. For example, students meeting the *acceptable standard* should know that the solution to the equation  $4(x + \frac{1}{2}) = -3$  is  $-\frac{5}{4}$  and be able to demonstrate their understanding by explaining how this solution can be arrived at and what it means for the solution to be  $-\frac{5}{4}$ . They are able to write related number sentences and verify them in any of the three modes.

To meet the *acceptable standard*, students are expected to explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models of representation.

Students meeting the *acceptable standard* are expected to perform the mathematical operations and procedures that are fundamental to mathematics in Grade 9 and apply what they know in solving straightforward problems in familiar settings. They are able to describe the steps they used to solve a particular problem and to verify and defend their solution to the problem.

The expectation is that students meeting the *acceptable standard* have a positive attitude about mathematics and a sense of personal competence in using mathematics. They are

able to demonstrate confidence when using common mathematical procedures and when applying problem-solving strategies in familiar settings.

### *Standard of Excellence*

Students who meet the standard of excellence in Grade 9 Mathematics are expected to have a superior understanding of mathematical concepts, related procedural knowledge, and novel problem-solving situations. They are comfortable demonstrating their understandings in concrete, pictorial, or symbolic forms of representation. For example, they are able to show that a triangle maintains its shape and its size whenever it is reflected in either of the coordinate axes, and are able to demonstrate this property by taking measurements off a relevant drawing, by using the properties of congruent triangles, and by using the length properties of segments on Cartesian grids. They are able to create and generalize problem situations to illustrate concepts and to analyze and explain relationships among the concepts.

To meet the *standard of excellence*, the students are expected to model mathematical situations clearly, using oral, written, concrete, pictorial, graphical, and algebraic methods. They are expected to understand mathematical questions presented with objects, diagrams, or symbols in common and unusual contexts.

Students meeting the *standard of excellence* are expected to perform the mathematical operations and procedures that are fundamental to mathematics in Grade 9 and to be able to apply mathematical thinking and modeling to solve and create non-routine problems. They are able to clearly describe the steps that they or other students used to solve a particular problem and can suggest alternative procedures and/or solutions. They are able to generalize solutions and strategies to new problem situations.

Students meeting the *standard of excellence* should have a positive attitude toward mathematics and show confidence in using mathematics meaningfully. They are expected to be self-motivated risk-takers who persevere when solving novel problems. They take initiative in trying new methods and are creative in their approach to problem solving.

## ***Grade 9 Mathematics Assessment***

### ***General Description***

The Grade 9 Mathematics test consists of two parts:

Part A has 40 multiple-choice questions each with a value of one mark

Part B has 10 numerical-response questions each with a value of one mark

The assessment is designed to be completed in 90 minutes. However, additional time of approximately 30 minutes may be provided to allow students to finish.

The blueprint for the assessment is on the next page of this bulletin and is followed by sample assignment questions that teachers can use with students to help them prepare for the provincial assessment.

Students will require HB pencils, rulers, protractors, and erasers.

Calculators are highly recommended.

### ***Reporting Categories Indicators***

The following points briefly highlight the learnings for each reporting category.

#### ***Knowledge and Skills***

- recalls facts, concepts, terminology
- knows “how”
- performs algorithms, computations
- uses formulas
- performs constructions, conversions, order of operations
- uses calculators and computers

#### ***Application and Problem Solving***

- knows “why,” “when,” and “knows that he or she knows”
- understands basic mathematical concepts
- understands relationships among number systems, operations, number forms (fractions, decimals, powers, etc.), and concrete, pictorial, and symbolic representation
- understands ratio and (direct) proportion
- understands relationships within formula
- understands relationships among geometric forms
- understands relationships among numbers and geometric forms
- understands definition of stages
- uses a variety of strategies
- applies mathematics knowledge in unfamiliar situations
- knows basic facts
- understands place value
- judges reasonableness of a solution
- formulates an approximation of an outcome
- knows and applies mental computation and estimation strategies



## ***Blueprint***

<b>Strands</b>	<b>Reporting Categories</b>		<b>Total Number of Questions</b>
	<b>Knowledge and Skills</b>	<b>Application and Problem Solving</b>	
<b>Number Systems and Operations</b>	5	8	13
<b>Ratio and Proportion</b>	3	6	9
<b>Measurement and Geometry</b>	4	7	11
<b>Data Management</b>	2	5	7
<b>Algebra</b>	4	6	10
<b>Total Number of Questions</b>	18	32	50

### ***Confirming Standards***

Confirming standards is a process whereby judgements about students' performance on the assessment are made in relation to provincial standards. For more information on confirming standards procedures, refer to Appendix A of the *Achievement Testing Program Provincial Report, June 1993 Administration*. For information on the selection of teachers for participation in the confirming standards process, refer to the current *Achievement Testing Program General Information Bulletin*.

## ***Preparing Students for the Assessment***

We hope that teachers will share the following information with their students to help them prepare for the mathematics assessment.

*I strongly advocate preparing children to understand tests and testing through extensive class discussion about the makeup of the test and how to take it, and then adequate practice to find out their own particular weaknesses in approaching tests.*

—Graves, p. 183

### ***Suggestions for Answering Multiple-Choice Questions***

Use information given by:

- a. looking at all the information and thinking carefully about it before you try to answer the questions; or
- b. reading the questions first and then looking at the information, remembering the questions you need to answer.

When you need information for more than one question, remember to *go back to the information before answering each question.*

*Make sure you look at all types of information given.* Information may be given in words, charts, pictures, graphs, and maps.

*Check your work when you calculate an answer,* even when your answer is one of the choices.

When answering questions, *choose the answer you think is best.* If you don't see a

correct or best answer right away, try to find the two choices that seem closest to the correct answer and choose one of them.

### ***Suggestions for Answering Numerical-Response Questions***

*Make sure you look at all the information given.*

Calculate your answer and check your work before entering the answer on the answer sheet.

## ***Suggestions for Teachers Administering the Assessment Example***

The following suggestions are to help teachers administer the sample assessment in the same way that the test will be administered.

### ***Sample Questions***

Teachers are encouraged to familiarize their students with the kinds of questions that will appear on the achievement test by having them work through the sample questions. A practice answer sheet for the numerical-response questions is provided so that students can familiarize themselves with this new form.

Sample questions that reflect the nature and complexity of the questions that will appear on the 1995 achievement test are presented on the following pages. Please note that this collection of questions does not represent the test emphasis as presented in the blueprint.

A table of the key and descriptors for the sample questions follows the questions on page 16.



**Part A: Multiple Choice**

*Use the information below to answer questions 1 and 2.*

One student's math test marks are as follows:

38, 72, 73, 73, 90

1. If, on the next math test, the student gets 33, which of these measures would be **most** affected?
  - A. Mode
  - B. Mean
  - C. Range
  - D. Median
  
2. Which of these measures would be **least** affected?
  - A. Mode
  - B. Mean
  - C. Range
  - D. Median

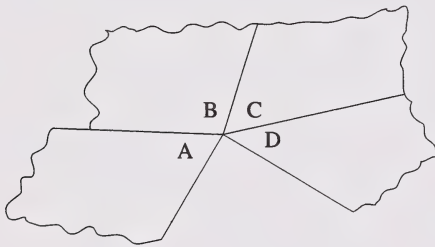
Use the following information to answer question 3.

The angles of a quadrilateral are torn off. The vertices of these angles are placed about a common vertex.

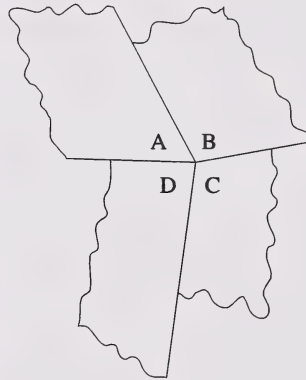


3. Which diagram below illustrates the sum of the four angles?

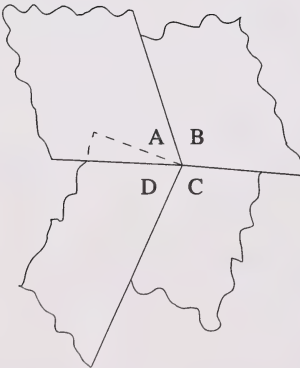
A.



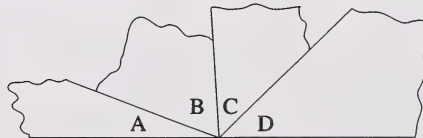
B.



C.



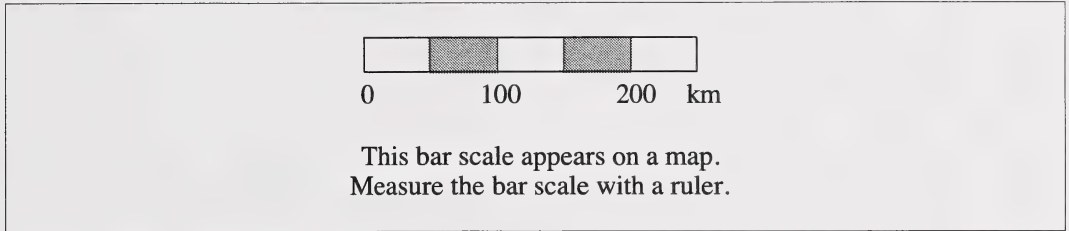
D.





4. The **part** of a population from which data are gathered is called a
- A. prediction
  - B. statistic
  - C. census
  - D. sample

*Use the following information to answer question 5.*



5. Which scale is equivalent to the bar scale?
- A. 1:5 000
  - B. 1 km to 50 km
  - C. 1:50 000
  - D. 1:5 000 000

*Use the following information to answer question 6.*

John found the solution to four problems. He wished to verify his solutions.

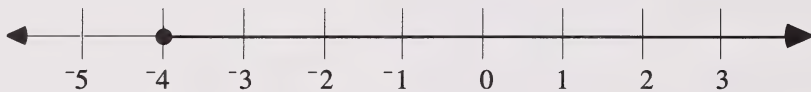
6. Which equation has the correct solution given?
- A.  $\frac{b}{-3} + 4 = 7, b = 9$
  - B.  $\frac{c + 4}{2} = 3, c = -2$
  - C.  $-2(d + 1.5) = 3, d = -3$
  - D.  $1.8e - 2.4 = 3, e = -3$

Use the following information to answer question 7.

You have found the volume of a rectangular prism (cereal box), a hexagonal prism (J-Cloth box), and a triangular prism (spectrum prism). You wish to generalize as to how to find the volume of any prism.

7. Which method could be used to find the volume of **any** prism?
- A. Square the edge of the base and multiply by the height of the prism.
  - B. Multiply the perimeter of the base by the height of the prism.
  - C. Multiply the edge of the base by the height of the prism.
  - D. Multiply the area of the base by the height of the prism.

Use the following information to answer question 8.



When problems involving inequalities are solved, the solution often contains more than one number. To show these numbers, a graph is made.

8. The above is a graph of
- A.  $-4 < x < 3$ , where  $x$  is an integer
  - B.  $x > -5$ , where  $x$  is an integer
  - C.  $x \leq -4$ , where  $x$  is a rational number
  - D.  $x \geq -4$ , where  $x$  is a rational number



Use the following information to answer question 9.

A rope that just reaches from the top to the bottom of a well can be wrapped around a cylindrical drum 10 times.

9. How many metres deep is the well if the drum has a diameter of 30 cm?

- A. 7.10
- B. 9.42
- C. 30.0
- D. 94.2

10.  $12 \text{ km}^2$  could be the area of a

- A. town
- B. city block
- C. living room
- D. baseball diamond

11. Which is the best estimate of the distance between the towns shown in the number line below?



- A. 50
- B. 150
- C. 250
- D. 350

## Part B: Numerical Response

Instructions: Read each question carefully.

Record your answer on the answer sheet by writing it in the boxes and filling in the circle in EVERY column as illustrated.

0	2	4	3
---	---	---	---

Make sure you fill in **all** boxes and corresponding circles in the column.

- Record only one answer for each question. If you change an answer, erase your first mark completely.
- Use **only** an HB pencil to mark your answer.
- Be sure that the number on the answer sheet matches the number of the question you are doing.

### Examples

1. Evaluate  $3^5$ .

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3$$

$$= 243$$

0243 has been recorded for you.

#### Answer Sheet

0	2	4	3
---	---	---	---

●	0	0	0
①	①	①	①
②	●	②	②
③	③	③	●
④	④	●	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

2. Each side of an equilateral triangle is 2 cm longer than each side of a square. Their perimeters are equal. Find the length of each side of the triangle.

Let  $x$  = length of each side of the square. Then  
 $(x + 2)$  = length of each side of the triangle.

$$4x = 3(x + 2)$$

$$4x = 3x + 6$$

$$4x - 3x = 3x + 6 - 3x$$

$$4x - 3x = 6$$

$$x = 6$$

The length of each side of the triangle is  $x + 2$ ,  
 where  $x = 6$ ; therefore,  $x + 2 = 8$  cm.

Record 0008 on the example on the right.

#### Answer Sheet

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0	0	0	0
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨



*Practice Answer Sheet for Numerical Response*

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1. How many digits are used in numbering the first 103 pages of a book?

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE  
SECTION OF THE ANSWER SHEET

*Use the following information to answer question 2.*

Jack plays hockey for the local hockey team. He averages six shots on goal per game. One shot of every five results in a goal.

2. If Jack were to score 360 goals in his career, how many games would he play?

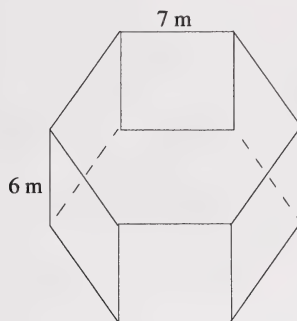
RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE  
SECTION OF THE ANSWER SHEET

3. A bag contains 400 marbles, some red, some white, and some blue. A random sample contains 8 red marbles, 6 white marbles, and 2 blue marbles. How many of the 400 marbles would be expected to be white?

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE  
SECTION OF THE ANSWER SHEET



4. The area of the base of a silo is  $84 \text{ m}^2$ . What is its volume?



RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE  
SECTION OF THE ANSWER SHEET

*Use the following information to answer question 5.*

The cost of a school ski trip is given by the relation  $C = 40n + 200$ , where  $C$  is the cost in dollars and  $n$  is the number of students who attend.

5. If the cost was \$2 080, how many students went on the ski trip?

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE  
SECTION OF THE ANSWER SHEET

## Sample Questions: Key and Descriptors

### Part A: Multiple-Choice

Ques. No.	Key	Program Strand*	Reporting Category**	Curriculum Standard	Examples of Assessment Standard***
1	B	DM	P	Use data from meaningful situations and understand and use the terms mean, median, mode, and range	A
2	A	DM	P	Use data from meaningful situations and understand and use mean, median, mode, and range	A
3	B	MG	K	Find the sum of interior angles in polygons	A
4	D	DM	K	Know the meaning of sample	A
5	D	RP	K	Identify the scale used in a diagram	A
6	C	A	K	Verify the solution to an equation	A
7	D	MG	P	Generalize a strategy for finding the volume of any right prism	A
8	D	A	P	Graph the solution to an inequality on a number line	A
9	B	MG	P	Apply understanding of perimeter and linear measurement to solve the problem	E
10	A	MG	K	Recognize a referent for units of measure for area	A
11	C	NO	K	Estimate the difference between points on a number line	A

### Part B: Numerical Response

Ques. No.	Key	Program Strand*	Reporting Category**	Curriculum Standard	Examples of Assessment Standard***
1	201	NO	P	Apply a numerical pattern to solve the problem	E
2	300	PS	P	Determine appropriate operations for solving the problem	E
3	150	DM	P	Apply an understanding of probability to solve the problem	E
4	504	MG	P	Apply a strategy for finding the volume of any right prism	A
5	47	A	P	Solve the equation to find the answer to the problem	A

\* DM—Data Management; MG—Measurement and Geometry; RP—Ratio and Proportion; A—Algebra; NO—Number Systems and Operations

\*\* P—Application and Problem Solving; K—Content Knowledge and Procedural Understanding

\*\*\* A—Students meeting the acceptable standard should be able to correctly answer questions such as these.

E—in addition to answering the questions identified for the acceptable standard, students meeting the standard of excellence should be able to correctly answer questions such as these.



## ***Credit***

Donald H. Graves, *Build a Literate Classroom* (Toronto: Irwin Publishing, 1991), p. 183.

## ***Alberta Education Contact***

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